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10/564,477	01/13/2006	Seppo Heimala	1034281-000003	8979

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Buchanan Ingersoll
Burns Doane Swecker & Mathis
P O Box 1404
Alexandria, VA 22313-1404

EXAMINER

SHEVIN, MARK L

ART UNIT	PAPER NUMBER
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1793

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/564,477	Applicant(s) HEIMALA ET AL.	
	Examiner Mark L. Shevin	Art Unit 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01/13/2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>01/13/2006</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Status

1. Claims 1-13, filed as a preliminary amendment on January 13th, 2006, are pending.

Priority

2. Applicant's claims to foreign priority benefit of Finish patent application: 20031083, filed July 17th, 2003, has been recorded.

Drawings

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 1-14,16-18, and 20-21 (present in para 0026-0028. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. **Claims 1-3 and 7-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Baczek** (US 4,256,553).

Regarding claim 1, Baczek is drawn to a process and system for recovering copper from chalcopyrite concentrate (Abstract).

Chalcopyrite (CuFeS_2) is the primary copper-bearing mineral mined, however this ore is extremely difficult to recover copper from by normal solution methods. Successful leaching methods also leach iron from chalcopyrite into solution, which then interferes in later processing steps such as electrolysis. For these reasons, dissolved copper and dissolved iron must be separated (col. 1, lines 20-35). The Examiner construes the process steps of instant claim 1 as follows:

- A. Concentrates divided into well soluble and poorly soluble components:
- B. Well-soluble components subjected to a leaching step and the solution from that is subjected to at least one conversion step:
- C. The conversion step is fed poorly soluble components and the copper in the well in the solution is converted to sulfidic form by means of a sulfide-form iron in the poorly-soluble component

- D. At least part of the solution obtained in the conversion step is recycled back to the leaching step:

With respect to step A, Baczek teaches that ground chalcopyrite from grinding mill **11** is split into two streams and the first stream is directed to a leach circuit which yields a solution of copper sulfate (well soluble component) (col. 4, lines 36-43). This well soluble component is separated from the remaining poorly soluble components, which includes unreacted ground chalcopyrite (sulfide form iron) (col. 4, lines 44-45 and 58-66). Baczek discloses a separator **50** from which components **63** than can be regarded as “well soluble” are transported to a leaching step **24**, while components **52** that can be regarded as “poorly soluble” are transported to a conversion step.

With respect to step B, the well soluble components are subjected to leaching steps **16** and **24** to produce a solution containing dissolved copper as copper sulfate (col. 2, lines 35-42) which is directed to via line **28** to a liquid-solid separation device **30** which separates the well-soluble copper sulfate solution and recycles the well-soluble copper sulfate solution to the first stage leaching reactor **16** to leach fresh chalcopyrite ore (col. 5, lines 24-30).

With respect to step C, well-soluble copper sulfate solution generated in the leach circuit is directed via line **14** to the conversion circuit and reacted with chalcopyrite concentrate to form poorly soluble copper sulfide (col. 6, lines 11-30). This conversion step that receives well-soluble concentrate is located first in the flowing direction (downward arrows indicated in conversion circuit show flow direction).

With respect to step D, Baczek does not explicitly teach that at least part of the solution obtained from the conversion step is returned to the leaching step, however:

It would have been obvious to one of ordinary skill in the copper hydrometallurgy arts, at the time the invention was made, to return at least a part of the solution obtained from the conversion step to the leaching step for several reasons. First the well-soluble copper sulfate solution from the leaching step is converted at **54** and at least a portion of this solution is fed to a second conversion unit **46** and on to separator **50** where at least a portion is feed back to the leach circuit using lines **63** and **66**. Furthermore, at least a part of the solution converted in conversion unit **54** eventually passes to either line **80** or **78** for recycling back to the leaching step. Thus Baczek implicitly suggests recycling at least a portion of the conversion effluent back to the leaching step.

Regarding claims 2 and 7, the different metal components are converted to sulfidic form by means of sulfide-form iron, in the form of chalcopyrite, fed into the conversion step (**44** fed into **46**).

Regarding claim 3, Baczek teaches that the leaching step is conducted between 85-90 °C at ambient pressure (col. 5, lines 63-68), thus Baczek teaches atmospheric leaching. The temperature range of Baczek is within the instantly claimed temperature range of 50-150 °C.

Regarding claims 8 and 9, one of ordinary skill in copper hydrometallurgy would recognize troilite and pyrrhotite as Fe_xS_y ore that would be expected to react similarly to chalcopyrite during conversion as taught by Baczek because of copper's demonstrated affinity for sulfur over iron in the chalcopyrite conversion reaction taught by Baczek. One would be motivated to add troilite and/or pyrrhotite conversion steps in an attempt to extract precious metals contained in those materials.

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5. **Claim 4** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Baczek** (US 4,256,553) as applied to claims 1-3 and 7-9 above, in further view of **Richmond** (US 6,537,440).

The disclosure of Baczek was discussed in the rejections of claims 1-3 and 7- 9 above, however Baczek does not teach leaching being carried out in an autoclave.

Baczek teaches that autoclaves cause oxidation of at least some of the sulfur contained in the chalcopyrite to sulfate which must then be removed from the system (col. 2, lines 6-11).

Richmond teaches that for extracting copper from a mineral feed containing copper sulphide mineral (abstract) and that highest leach recoveries are often obtained by having elevated ferric/ferrous rates at the end of the leach. This is difficult to attain in an atmospheric leach as the rate of oxygen dispersion in the pulp is limited (col. 2, lines 14-21). Richmond subsequently teaches that autoclave leaching should be carried out to address the deficiencies of the prior art processes (col. 2, lines 18-21 and Abstract, feature **20** in Figure. 1).

Richmond further teaches that there may be more than one leaching step including one or more subsequent leaching steps carried out under normal atmospheric conditions (col. 3, lines 24-29).

Regarding claim 4, it would have been obvious to one of ordinary skill in the copper hydrometallurgical arts, at the time the invention was made, to combine Baczek in view of Richmond to carry out leaching using an autoclave as Richmond suggests, beyond the complaints of Baczek at col. 2, that autoclave leaching allows higher leach

recoveries than atmospheric leaching and thus one would be motivated by the expectation of higher copper yield in leaching.

6. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Baczek** (US 4,256,553) as applied to claims 1-3 and 7-9 above, in further view of **Johnson** (US 3,957,602).

The disclosure of Baczek was discussed in the rejections of claims 1-3 and 7-9 above and while Baczek does teach conversion, he does not teach a temperature in the claimed range for conversion.

Johnson teaches a process for hydrometallurgically recovering copper from chalcopyrite (copper sulfide material) which involves leaching and converting the chalcopyrite to form an insoluble copper sulfide (claim 9). The conversion reaction is conducted between about 150 and 250 °C (col. 2, lines 31-40). Johnson also teaches that in addition to chalcopyrite, the starting materials may contain sulfides of other metals (col. 2, lines 18-25). Although Baczek teaches that Johnson's process requires "...the utilization of expensive autoclaving equipment..." and "generates significant amounts of excess free acids" (col. 3, lines 18-26), Johnson teaches that the reaction time is inversely proportional to temperature, the amount of time decreasing with increased temperatures (col. 2, lines 53-55).

Regarding claims 5 and 6, it would have been obvious to one of ordinary skill in copper hydrometallurgy, at the time the invention was made, taking the disclosures of Baczek and Johnson as a whole, to combine Baczek in view of Johnson to conduct the conversion step between 90-200 °C (and 150-190 °C) as Johnson teaches that

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conversion of chalcopyrite to digenite (Cu_9S_5) is preferably conducted between 150 and 250 °C, a range that overlaps the claimed temperature range and thus establishes a prima facie case of obviousness. MPEP 2144.05, para I states: "In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists."

7. **Claims 10-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Baczek** (US 4,256,553) as applied to claims 1-3 and 7-9 above, in further view of **Heimala** (US 5,108,495).

The disclosure of Baczek was discussed in the rejections of claims 1-3 and 7-9 above, however Baczek does not teach the control of flotation, leaching, or conversion by means of mineral-specific electrochemical measurements.

Heimala teaches a method for controlling a process in which complex ores and/or concentrates are treated in order to achieve valuable components contained therein where the process is controlled by oxidation/reduction reactions, flotation, leaching, and precipitation processes for different materials (col. 1, lines 5-12). The object of Heimala's invention is to control a process using active mineral electrodes and analyzing the state of the solid surface and/or the state between the solid material and the intermediate material and subsequently controlling these interfaces (col. 2, lines 21-30).

Heimala teaches in Example 4, (starting at col. 8) a specific embodiment using the process of his invention to separate copper minerals containing arsenic and antimony from essentially pure copper minerals such as chalcosite, covellite,

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chalcopyrite, etc. (col. 8, lines 34-40). Furthermore, the method can be applied to slags (col. 4, lines 6-10). Example 3 teaches recovering valuable components from a sulphide ore based on pyrrhotite where leaching was carried out in an autoclave (col. 7, lines 50-62).

Impedance analysis is used to control leaching and flotation processes and the information measured by impedance analysis means that the leaching velocity can be maximized for sulphur compounds and compounds such as pyrite (FeS_2) or NiS_2 can be passivated (col. 2, lines 45-68). Furthermore, the covering effect created by a given sulphur compound using a reagent such as sulphides can be chosen such that selective flotation, leaching, or precipitation is carried out, resulting in economic advantages (col. 3, lines 1-9).

It would have been obvious to one of ordinary skill in copper hydrometallurgy, at the time the invention was made, taking the disclosures of Baczek and Heimala as a whole, to combine Baczek in view of Heimala to control flotation, leaching, and conversion based on mineral-specific electrochemical measurements, for the following reasons. Heimala teaches a method for controlling the electrochemical potential in an oxidation/reduction process for treating complex ore/concentrates using electrodes made of a material similar to the material similar to the material being treated (claim 1) where this process is used to control conversion (precipitation of sulfide which is part of precipitation - claim 10), leaching (claim 11), and flotation (claim 9). Heimala further teaches that his process can be applied to copper sulfide bearing materials (Examples 3 and 4). Motivation to combine Heimala with Baczek comes from the benefits taught in

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Heimala of increased process efficiency and economic advantages (col. 2, line 45 to col. 3, line 10).

Regarding claim 10, claim 9 of Heimala discloses controlling flotation through impedance analysis and thus when combined with the disclosure of claim 1, discloses controlling a flotation process controlled by means of mineral specific (electrodes of similar materials - claim 1) electrodes that takes electrochemical measurements (claim 1 and impedance at claim 9).

Regarding claim 11, claim 11 of Heimala discloses controlling flotation through impedance analysis and thus when combined with the disclosure of claim 1, discloses controlling a leaching process controlled by means of mineral specific (electrodes of similar materials - claim 1) electrodes that takes electrochemical measurements (claim 1 and impedance at claim 11).

Regarding claim 12, claims 8 and 10 of Heimala disclose controlling flocculation and precipitation through impedance analysis and thus when combined with the disclosure of claim 1, disclose controlling a conversion process (conversion involves flocculation and precipitation) controlled by means of mineral specific (electrodes of similar materials - claim 1) electrodes that takes electrochemical measurements (claim 1 and impedance at claim 8 and 10).

8. **Claim 13** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Baczek** (US 4,256,553) as applied to claims 1-3 and 7-9 above, in further view of **Gabb** (US 5,616,168)

The disclosure of Baczek was discussed in the rejections of claims 1-3 and 7-9 above, however Baczek does not teach that the precious metals contained in the concentrates are recovered at the conversion step.

Gabb is drawn to the treatment of impurities streams during the smelting of copper concentrate and the converting of copper matte (col. 1, lines 14-17). In particular, his invention relates to a streamlined hydrometallurgical process that captures and returns for further processing many impurity stream components (col. 1, lines 22-25). Gabb teaches (col. 5, lines 5-10) that precious metals from his acid leach step are incorporated into the copper sulfide product produced during the copper precipitation (conversion) stage. Thus, these precious metals are recovered for treatment at this first conversion stage. Col. 5, lines 10-22 teaches that the copper is precipitated out as a sulfide while leaving behind all other metals. Lastly, Gabb teaches that the solid fraction from the acid leach step contains copper, precious metals, lead, and other metal values and the residue can be removed from the circuit for recovery and subsequent sale (col. 6, lines 62-67).

Regarding claim 13, It would have been obvious to one of ordinary skill in copper metallurgy, at the time the invention was made, taking the disclosures of Baczek and Gabb as a whole, to combine Baczek in view of Gabb to recovery precious metals at the first conversion step for the following reasons. Baczek teaches a recovery unit **40** for the recovery of precious metals such as gold and silver from the leach circuit (col. 5, lines 49-53) as well as stating at col. 8, lines 18-26, that the precious metals are present in the conversion circuit while Gabb suggests that precious metals could be removed at

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the copper precipitation stage (conversion to sulfide) for sale (col. 5, lines 5-22 and col. 6, lines 62-67).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Schlitt (US 4,152,142)

Makinen (US 4,717,419)

Rantapuska (US 4,917,775)

Ruonala (M. Ruonala et al, Different aspects of using electrochemical potential measurements in mineral processing, *Int. J. Miner. Process.* 52 (1997) p. 97-110).

-- Claims 1-13 (All pending) are rejected

-- No claims are allowed

The rejections above rely on the references for all the teachings expressed in the text of the references and/or one of ordinary skill in the metallurgical art would have reasonably understood or implied from the texts of the references. To emphasize certain aspects of the prior art, only specific portions of the texts have been pointed out. Each reference as a whole should be reviewed in responding to the rejection, since other sections of the same reference and/or various combinations of the cited references may be relied on in future rejections in view of amendments.

All recited limitations in the instant claims have been met by the rejections as set forth above. Applicant is reminded that when amendment and/or revision is required, applicant should therefore specifically point out the support for any amendments made to the disclosure. See 37 C.F.R. § 1.121; 37 C.F.R. Part §41.37 (c)(1)(v); MPEP §714.02; and MPEP §2411.01(B).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark L. Shevin whose telephone number is (571) 270-3588. The examiner can normally be reached on Monday - Thursday, 8:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark L. Shevin/

/Roy King/

Supervisory Patent Examiner, Art Unit 1793

March 24th 2008
10-564,477